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MODERN NATURAL HISTORY MUSEUMS AND THEIR RELATION TO PUBLIC EDUCATION

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I WISH to make a plea in behalf of the educational value of natural history museums. The place of the museum in public education is not even yet fully appreciated, either in this country or in Europe, by the general public or even by the most intelligent classes. A striking illustration of this fact is found in the recent proposed action of the British government to close all museums and art galleries. The Retrenchment Committee of the House of Commons, in order that the resources of the country might not be used except for the really essential things in this distressing time of war, recommended the closing of all the national museums in London, except the reading room at the British Museum, parts of the National Gallery, and the Victoria and Albert Museum. The proposed action was justified on the ground that a saving of 5,000 pounds could be made, that the museum employees would then be available for war service, and that museums are, primarily, merely "places of pleasant resort," anyhow! Such a strong protest was made, however, that the order was materially modified.

Museums had their origin in the effort to preserve and care for the rare and curious objects which travelers brought home from distant lands. Collecting rare and strange objects was first raised to the dignity of a fine art in Italy. The Medici at Florence and the Estes at Modena were the first; they set the example which in time spread throughout Europe.

But the collectors of those days were rarely imbued with the scientific spirit; their motives were largely selfish. They were usually wealthy and cultivated amateurs who assembled and maintained collections for their own pleasure and glorification.

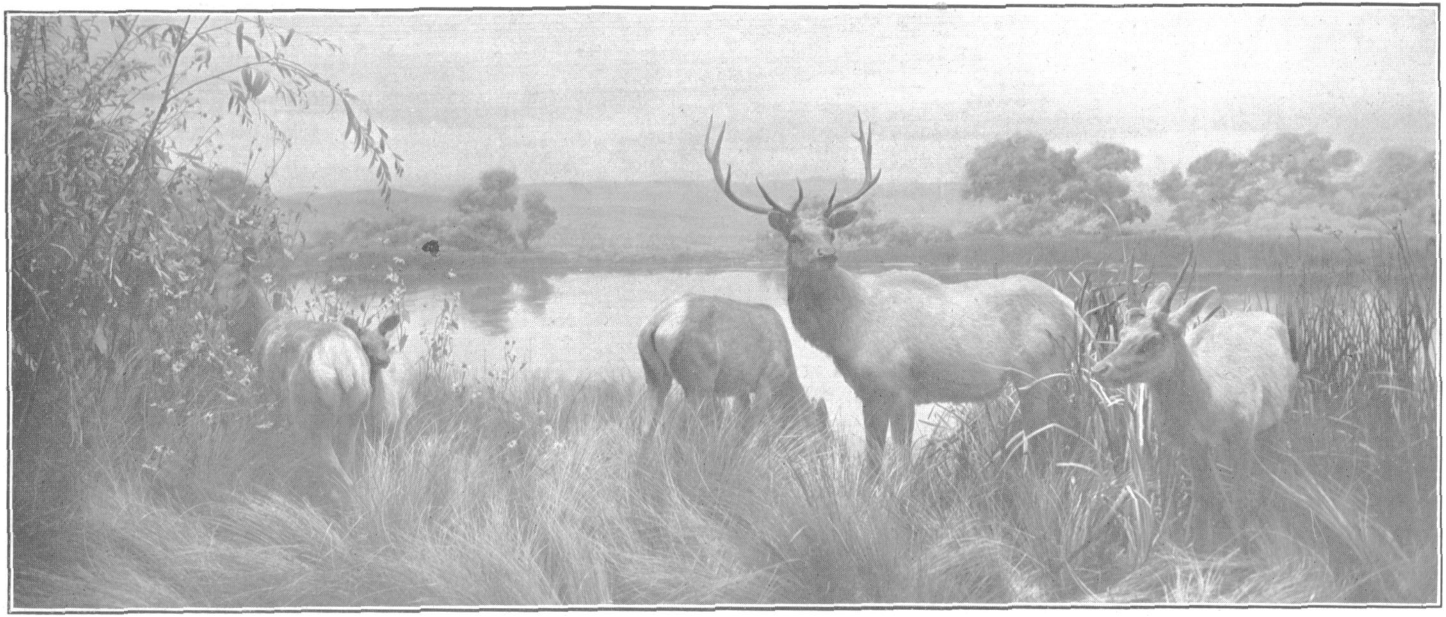

FIG. 1. SAN JOAQUIN VALLEY ELK (*Cervus nannodes*)

This beautiful animal, sometimes known as the Tule Elk or Dwarf Elk, formerly ranged in vast numbers through the San Joaquin-Sacramento Valley. Only a few hundred now remain. That the species is not entirely extinct is due to the foresight and interest of the late Henry Miller, founder of the great cattle company of Miller and Lux. In the early seventies, when only a few individuals were left, the herd made its last stand on the Kern County ranch of Miller and Lux. Mr. Miller instructed his cattlemen not to disturb the elk in any way. His instructions were carried out and now the herd is in a very prosperous condition. Recently the California Academy of Sciences, with the assistance of Messrs. Miller and Lux, caught and distributed 150 of these Elk to a dozen or more large public or private parks or reservations in California where the conditions are favorable for the increase of the species. Background by Charles Abel Corwin.

It was not until 1753 when the British Museum was established at Bloomsbury and the collections of Sir Hans Sloane acquired, that the idea of a public museum emerged. It was then realized, apparently for the first time, that a museum, to advance art and scientific knowledge, must be liberally endowed, or else fostered by the state. But the founding and development of museums up to recent times need not detain us. With the founding of the British Museum in 1753 and the National Museum at Washington nearly a century later, the idea of the public museum may be said to have become firmly established.

In discussing the development of the United States National Museum Dr. G. Brown Goode considered the history of that institution as falling into three periods:

First, the period from the founding of the Smithsonian Institution to 1857, during which time specimens were collected solely to serve as materials for research. No special effort was made to exhibit them to the public or to utilize them, except as a foundation for scientific description and theory.

Second, the period from 1857 to 1876, during which the museum became a place of deposit for scientific collections which had already been studied, these collections, so far as convenient, being exhibited to the public and, so far as practicable, made to serve an educational purpose.

Third, the present period (beginning with 1876) in which the museum has undertaken more fully the additional task of gathering collections and exhibiting them on account of their value from an educational standpoint.

During the first period the main object of the museum was scientific research; in the second, the establishment became a museum of record as well as research; while in the third period has been added the idea of public education. The three ideas—record, research and education—cooperative and mutually helpful as they are, are essential to the development of every great museum.

Dr. Goode regarded the National Museum first, as *a museum of record,* in which are preserved the material foundations of an enormous amount of scientific knowledge—the types of numerous past investigations; second, as *a museum of research,* which aims to make its contents serve in the highest degree as a stimulus to inquiry and a foundation for scientific investigation; and third, as *an educational museum,* through its policy of illustrating by specimens every kind of natural object and every manifestation of human thought and activity, of displaying

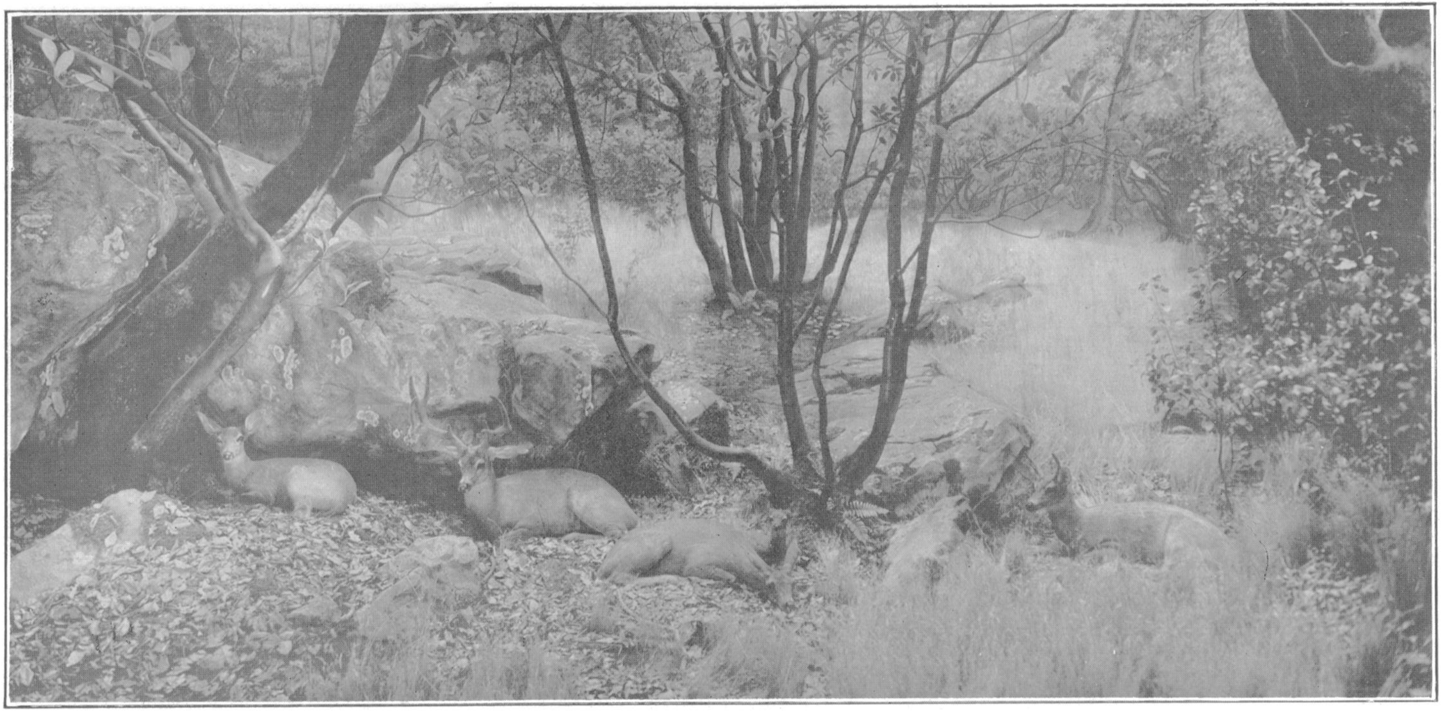

FIG. 2. COLUMBIAN BLACK-TAILED DEER (*Odocoileus columbarius*)

This group represents a summer scene in Mendocino County, California, where the deer shown were taken. At this season the deer assume what is known as the "red coat," which is gradually shed, changing to the bluish coat. The hair then becomes grayer in color as it lengthens for the winter months. In the spring the long hairs of the winter coat are shed and again replaced by the short red coat of summer.

The horns are shed annually, usually in February and March. The entire antler drops off from the skull at the base of the horn or "burr." A new horn sprouts out from the skull and, normally, develops into the antler characteristic of the species. The common belief that a deer develops a new point on the antlers each year and that the number of points indicates the age of the animal is erroneous. Background by Charles Abel Corwin.

descriptive labels adapted to the popular mind, and of distributing its publications and its named series of duplicates. This admirable statement of the scope and objects of the National Museum, made by Dr. Goode twenty years ago, still applies in its general terms to that institution, and equally well to a number of other museums in America.

The one thing which will most strongly impress any one who visits the museums of the east is their activity along educational lines, and the ways in which they are endeavoring to interest the public, and to be of service to the community. It is apparent that the museums of the east are realizing more and more that they owe a debt to the public and to those who have made their existence possible. Until recently most museums have done little or nothing in respect to general education.

> They have been content to be merely vast depositories for collections of priceless value, either unseen or gazed upon in mute wonder by those who visited them.

In such museums visitors "wander listlessly and aimlessly about the halls and galleries, with little appreciation and scarcely any understanding of the treasures that surround them."

But a great change has come about within the last few years. Now, the museum has come to regard itself, and to be regarded by the public, as an educational institution, working in cooperation with the public and private schools, for the good of all the children who can be brought within its influence. It is now realized that a public museum, in order to justify its existence, must be of real service, not only to investigators, but to the general public as well.

To meet the needs of the investigator, the museum must be an institution for research, an institution for the advancement of knowledge and its diffusion among men. A museum furnishes facilities for research and the acquirement of knowledge through, and in proportion to the completeness of, its research collections, and the encouragement it gives to field and laboratory investigations. The knowledge acquired by its investigators through field and laboratory investigations and studies is made known to the world chiefly through the medium of the museum's publications.

The second function of a public museum—perhaps, I may say, the most important function, because it may be regarded as including the first—is that of usefulness to the public in an educational way. Not until recently has this function been fully realized or received attention; but now it is the dominant and

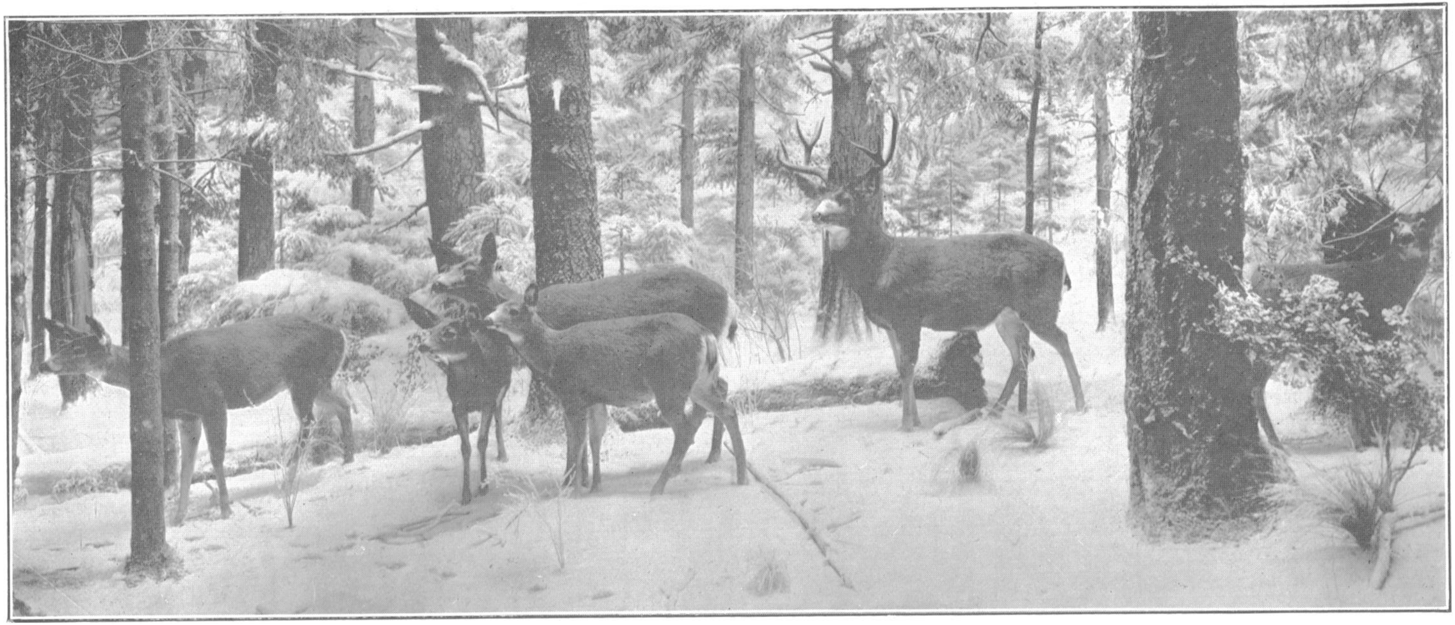

FIG. 3. ROCKY MOUNTAIN MULE DEER (*Odocoileus hemionus*)

This splendid deer is of wide distribution. In California it is found in the Sierras from Kern County northward, coming to the coast in the northern counties. The animals here shown were taken in Siskiyou County, California, in October. This is the largest of the North American deer, the adult male in prime condition weighing nearly 400 pounds. The name "mule deer" is sometimes applied to this species because of its long ears and its mule-like tail. Background painted by Charles Abel Corwin.

controlling thought in many of our museums, great and small.

It is true that most museums, from the very beginning, have maintained considerable collections of natural history objects, and specimens of other kinds, which the visitor might see; but as Director Lucas, of the American Museum of Natural History, has so well said,

> The visitor was greeted by row upon row of animals, most literally stuffed, arrayed in ranks and accompanied by labels whose principal mission was to convey to the public what to them is a most unimportant matter, the scientific names.

But this is not our conception of the modern natural history museum; nor is the modern museum merely a "Haunt of the Muses." It is more than that. It must be not only a place "dedicated to the cultivation of learning" and frequented by men and women devoted to learning and the improvement of human knowledge, but it should be a treasure-house of specimens of the animals, plants and other natural objects of the world, and of objects illustrative of the activities of the races of men.

The educational idea has taken firm hold on many of our American museums. It is manifesting itself in activities along a number of lines, the principal of which are:

1. The installation of large habitat and ecological groups of birds, mammals, etc.
2. The preparation of portable habitat groups for loan to public and private schools.
3. The maintenance at the museum of courses of lectures on natural history, and other subjects adapted to the needs of school children of the different grades.

I can probably best show what this idea is and what a firm hold it has by briefly telling how it is worked out in certain of our more active institutions.

Habitat Groups.—Perhaps the greatest advance of recent years in making museums really educational is in the matter of the installation of exhibits of animals and plants. The improvement has been chiefly with habitat and ecological groups, in giving the animals their natural surroundings, placing them in their natural environment. Until recently in most museums (and in some even to this day) the exhibition specimens of birds and mammals were fastened to a board of some kind and then placed in glass cases, usually against the wall, with no accessories whatever about them, even to suggest in what sorts of places they could be found alive. Now, all that is changed. The species to be shown is shown as a group of individuals—a pair of adults (male and female), one or more young, the nest if it be

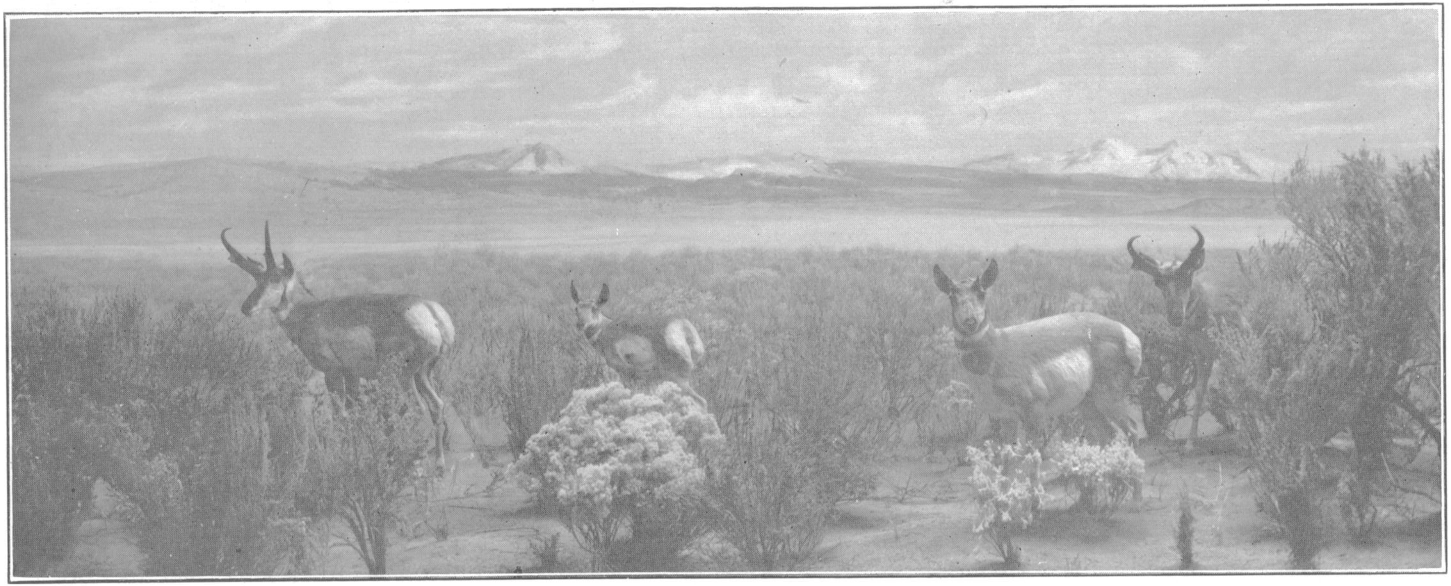

FIG. 4. ANTELOPE (*Antilocapra americana*)

The antelope or pronghorn formerly ranged in immense numbers over the plains and valleys of North America west of the Mississippi River from Mexico to Canada. In California great herds were found throughout the Sacramento and San Joaquin valleys and in other valleys to the north, east and south. As a result of persistent persecution and slaughter for their hides and meat, these animals have, in most parts of their range, been entirely exterminated. In southeastern Oregon and northwestern Nevada they are still common. In California small isolated bands are still left. In all these states they are protected by law. The antelope is the only member of the hollow-horned animals which annually sheds its horns. Only the outer shell or sheath, however, is shed, and not the entire horn, as in the deer and elk. The antelope is also unique in not possessing dew claws or accessory hoofs on the backs of the feet, as in the deer. The background was painted by Charles Abel Corwin.

a bird, the den in many species if it be a mammal, and the group surrounded by the trees and shrubs, annual plants, and other objects which together make up a bit of just such landscape as you would find the animals in should you seek them alive and in their natural habitat. As only a limited amount or number of units of the environment can be shown by means of the real objects, the setting is made more complete by means of a painted background, the real and the painted being so joined as to make it difficult, in most cases impossible, to tell where the real ends and the painting begins. Along with this improved installation of the group, the problem of proper lighting has also been more satisfactorily solved, as I shall explain later. Among museums which have given special attention to habitat groups I may mention the American Museum of Natural History in New York, the Brooklyn Museum, the Field Museum in Chicago, the Chicago Academy of Sciences, the Milwaukee Public Museum, and the University of Iowa.

Lectures.—A second way in which modern museums are rendering real service to the community is through the medium of public lectures at the museum, on natural history or other scientific subjects of popular or general interest. Not only are courses of lectures provided for adults, but, of greater importance, courses are provided to meet the needs of the different school grades. The lectures usually relate to subjects for which there is found in the museum illustrative material. Instead of the children coming to the museum and wandering through the halls without any real, definite object in view, they are, through observation and explanatory lectures, led to a fuller appreciation of the museum exhibits.

A definite plan of cooperation with the public schools is, of course, necessary. The lectures are upon subjects that form a regular part of the school curriculum. They are adapted to the needs and understanding of the children of the different grades and the courses are maintained throughout the school year. On one day the lecture will be given to, say, fourth-grade pupils; on other days to other grades. The lecturer may give the same lecture three or four times the same afternoon, to as many different groups of fourth-grade children, because all the children of any one grade in the city make too large a number to be accommodated at one time. Definite arrangements are made with the school authorities as to the order in which the classes are to come. The next day, fifth-grade pupils may come, the next day, sixth, and so on.

The American Museum of Natural History in New York

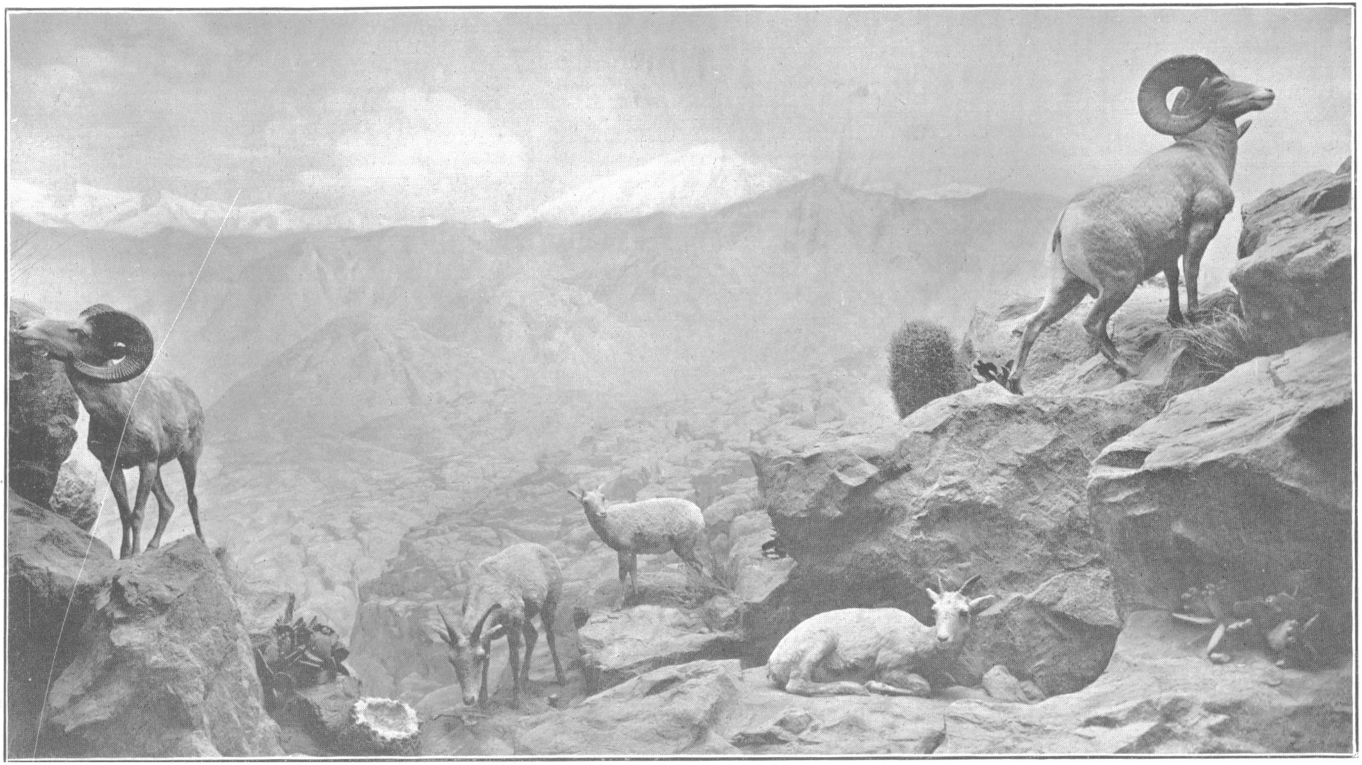

FIG. 5. DESERT MOUNTAIN SHEEP (*Ovis cremnobates*)

This species of mountain sheep or bighorn is found in the desert mountains of southern California and adjacent parts of Nevada, Arizona and Mexico. The animals in this group were taken in December, 1913, in the San Jacinto Mountains, Riverside County, California. The slender horns of the females have given rise to the mistaken belief that the ibex—an animal found only in Europe and Asia—is found in America. The story that mountain sheep sometimes jump from high precipices and alight on their horns is entirely erroneous, and is on a par with the hoopsnake, sea serpent and other similar stories. In the desert mountains water is usually scarce, and the mountain sheep frequently eat the barrel cactus, the pulpy interior of which contains a large percentage of water; and this no doubt enables the sheep to go for long periods without drinking. Background painted by Charles Abel Corwin.

and the Milwaukee Public Museum have perhaps been most active in the matter of lectures. The lectures given deal with various subjects, as geography, American history, birds of our parks, fur-bearing animals found within 50 miles of the museum, wild flowers of the vicinity, public health, and many other subjects. All the lectures are illustrated by materials and specimens in the museum, by appropriate stereopticon slides (of which each of these museums possesses many thousands), and by moving pictures, photographs and other illustrations. These museums each now maintain a regular department of public education with a competent curator and expert lecturers. Many thousand children attend the lectures, and excellent results are accomplished. Similar excellent work is being done by other institutions.

Although the lecture courses have proved very successful and reach a large percentage of the pupils, they do not and can not reach all. In a large city it is impracticable for the children in the remote, more distant schools to reach the museum. The time required to make the journey to the museum, then back to the school, and the expense involved, are too great. Many children can not afford the cost of car fares. To meet this difficulty it was felt that if the children could not come to the museum, the museum should be sent to the children; and this was done by providing traveling or circulating exhibits or collections, usually called

Loan Exhibits.—These may be habitat groups of small mammals, birds or other animals; minerals, plants, woods and various other objects. For example, it may be a California Quail group showing a pair of adult birds, their nest and young, together with the appropriate surroundings; or it may be a field mouse, adults, nest and young, and the sort of place in which they are naturally found. The case containing the group is small enough to be handled readily, and is made so as to appear attractive. A label accompanies each case, giving the information that school children would naturally wish to know regarding the species. These portable exhibits are loaned to the public schools and are used by the teachers in their nature work and object-lesson teaching. In making up the groups the school authorities are consulted and such groups are prepared as fit into the regular school curriculum.

This is perhaps the most effective way in which the museum can cooperate with the public schools. Several museums are doing excellent work in this line, among which I must mention particularly the Field Museum in Chicago and the American

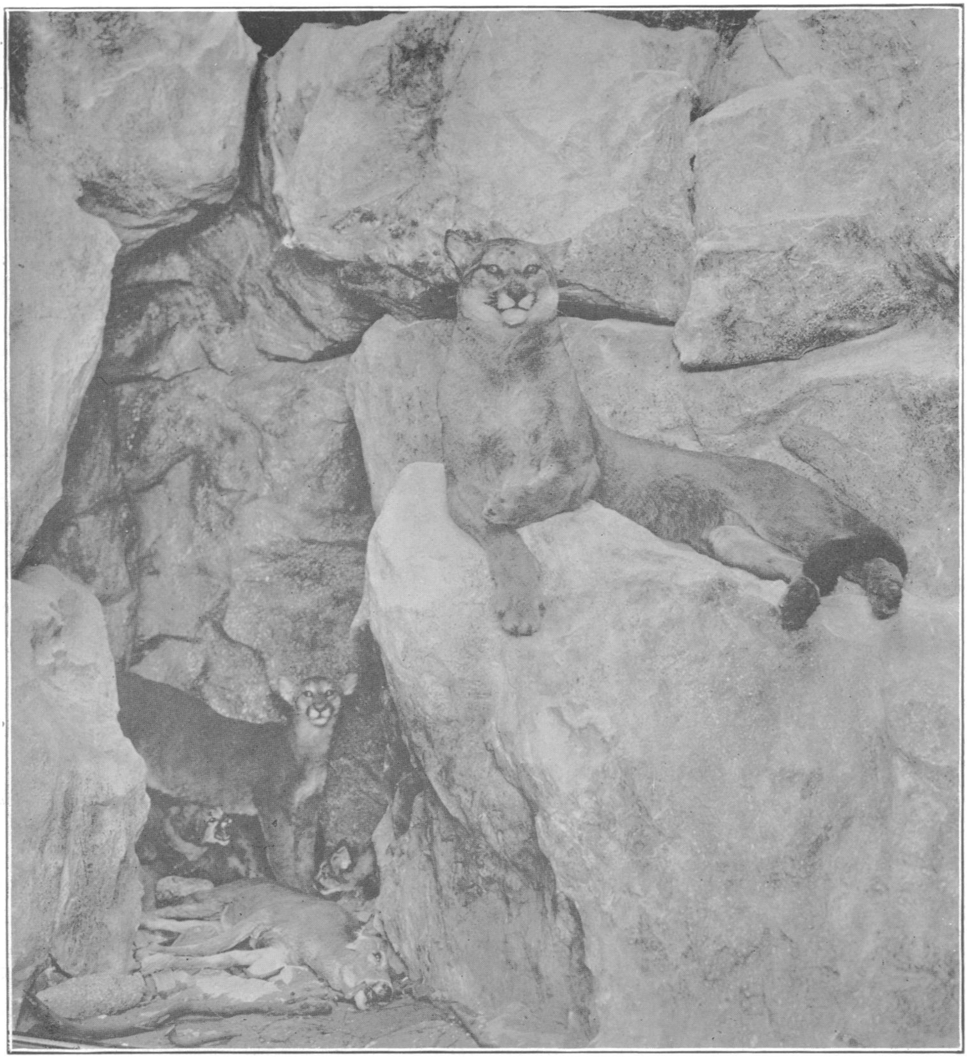

FIG. 6. MOUNTAIN LION (*Felis oregonensis*)

The mountain lion, in its various forms, is found from Patagonia to Canada, and from the Atlantic to the Pacific. In different parts of its range it is known by different names, as, panther, "painter," cougar, etc. Although not so common as formerly it is still plentiful in certain sections of California, especially in the northern part of the state. The animals in this group were taken in Humboldt County. The mountain lion is the largest of the North American cats. It is very destructive to deer and certain domestic animals, particularly colts and sheep. It has been estimated that each lion in California kills on an average one deer a week throughout the year. So destructive is it that the state pays a bounty of $20 each for its capture. Up to June 30, 1916, the state had paid bounties on 2,534 lions. Although the mountain lion is looked upon as a very fierce animal and more or less of a menace to human beings, it is really a very wary animal, and instances of its attacking man are rare indeed. It is generally easy to tree, even with a cur dog, and chasing it with dogs is the method usually employed in its capture.

Museum of Natural History in New York. A few years ago the Field Museum began this work on a small scale. A public-spirited citizen, Mr. N. W. Harris, saw what they were doing and became deeply interested. Mr. Harris is a man of vision. He at once saw the wonderful possibilities of this method of teaching and the good results that can come from cooperation with the public schools. After investigating the matter carefully, he decided to give to the Field Museum the sum of $250,000 as an endowment for educational work of this kind. With this fund there was established "The N. W. Harris Public School Extension of Field Museum of Natural History." The entire income of this endowment is devoted to educational work. Habitat groups of convenient size and form, attractive in appearance, and such as will teach lessons of real value to the children, are provided in large numbers. Economic collections, such as illustrate or relate to the practical phases of natural production and distribution, geography and commerce, are also made use of. These exhibits are distributed by automobile to the various schools where they are placed in the care of the principals. The cases are allowed to be retained two weeks, and then sent on to the next school on the list. The American Museum of Natural History is also doing the same thing and with very gratifying results.

This practise of sending the museum to the schools, instead of having the school children come to the museum, has the advantage of making it possible to reach a larger number of pupils than could otherwise be reached, and it is more economical of the time of the pupils and teachers. It also makes it easier for the teacher to make the lesson more concrete and more effective.

May I be permitted at this time to speak particularly of the Museum of the California Academy of Sciences and what it is trying to do in the interest of public education. Although the California Academy of Sciences was founded in 1853, just 100 years after the founding of the British Museum of Natural History at Bloomsbury, it was not until recently that any definite attempt was made by it to develop a museum along educational lines. The Museum of the California Academy of Sciences, speaking broadly, feels that it has two primary functions—to promote scientific research with special reference to making known the natural resources of California and the other Pacific coast states, and second, to aid, as best it may, in public education in natural history and other science subjects.

In furtherance of these objects the academy has recently built the first unit of a new museum building in Golden Gate

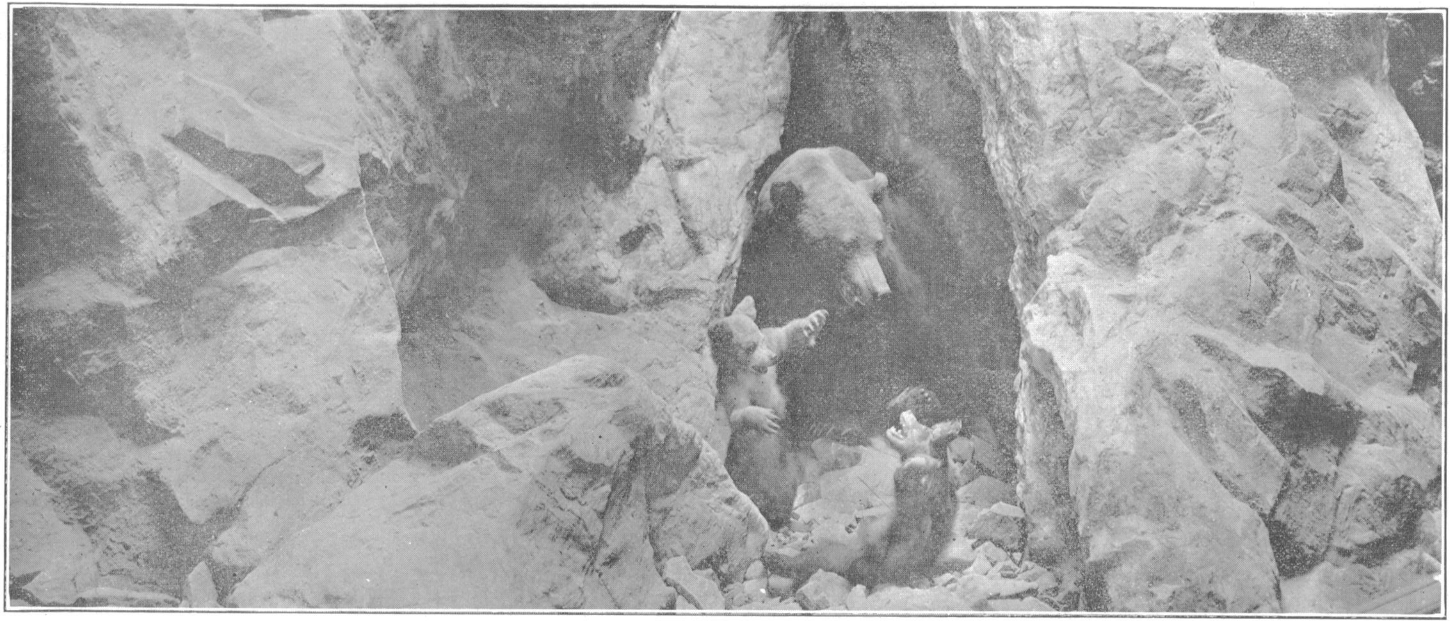

FIG. 7. NORTHWESTERN BLACK BEAR (*Ursus americanus albifrontalis*)

The black bear in its various forms ranges generally from the Atlantic to the Pacific and from northern Mexico to Alaska. The specimens in this group were taken in Humboldt County, California. In California, as elsewhere, the black bear may be either black or brown. In some instances both black and brown cubs are found in the same litter, and with either a black or a brown mother. Brown bears are sometimes confused with the grizzly which is now believed to be extinct in California. Black bears occasionally kill sheep and pigs, but they live chiefly on nuts, roots and berries; grubs, worms, and insects also enter largely into their menu. As a rule the black bear is a wary animal and will rarely or never attack a man unless wounded or cornered. From one to four cubs (usually one or two) are produced in a litter. The cubs are usually born in January (in California) and are helpless little creatures; their eyes, like those of puppies and kittens, are closed and do not open for some time. They have no teeth and are almost naked. Although the mother bear may weigh three or four hundred pounds, the whole litter of cubs will weigh less than a pound. The cubs shown in this group were about two months old when taken.

Park. This unit, known as the West Wing, consists of a front hall 180 feet long by 60 feet wide, with two rear wings each 128 feet long by 60 feet wide, with a court 70 feet wide between them. Tying the two rear wings to the front is a connecting hall 180 feet long by 18 feet wide. The building is of Bedford, Indiana, limestone and reinforced concrete, and is essentially fireproof. The rear wing on the west is the Research Wing and has two floors. The other wing is for exhibits and has one floor. The front hall is for exhibits and has one floor. An unique feature of the two main exhibition halls is that they have no windows; the lighting is from skylights. The large front hall is devoted entirely to California mammals, and the rear exhibition hall to California birds.

In each of the exhibition halls the cases are built in against the wall. The regulation case for a large mammal or bird habitat group is 25 feet long, 12 feet deep and 18 feet high. Each case has a plate-glass front 15 feet long and 10 feet high. There are 11 of these large cases in the mammal hall and six in the bird hall. In the former are installed habitat groups of various species of large California mammals, and in the bird hall are similar habitat groups of California birds.

Among the groups alreads installed may be mentioned the Valley elk, black-tail deer (summer scene), mule deer (winter scene), antelope, desert mountain sheep, mountain lion, black bear, leopard seal, California sea lion, Steller's sea lion, coyote, Farallon Islands bird rookeries, San Joaquin water bird breeding grounds, desert bird group, California condor, and others. In each group the animals are placed in their natural environment, surrounded by the shrubs, trees, flowers, rocks and other objects such as make up a bit of the scenery which surrounds them in the region where they are found in nature. Then the real is extended by means of a curved painted background which connects so perfectly with the real objects in front as to make it difficult, if not impossible, to tell where the real ends and the painted begins. In addition to these large habitat groups similar small groups of smaller mammals and birds are being installed in suitable places at the ends of the large groups. These usually show a family of a single small species and the den and young if a mammal, and the nest, eggs or young if a bird.

One of the most serious problems in museum construction has been that of proper lighting. In most museums the visitor not only sees the animals in the case, but he sees himself there, and all the people about him, and all the other objects in that

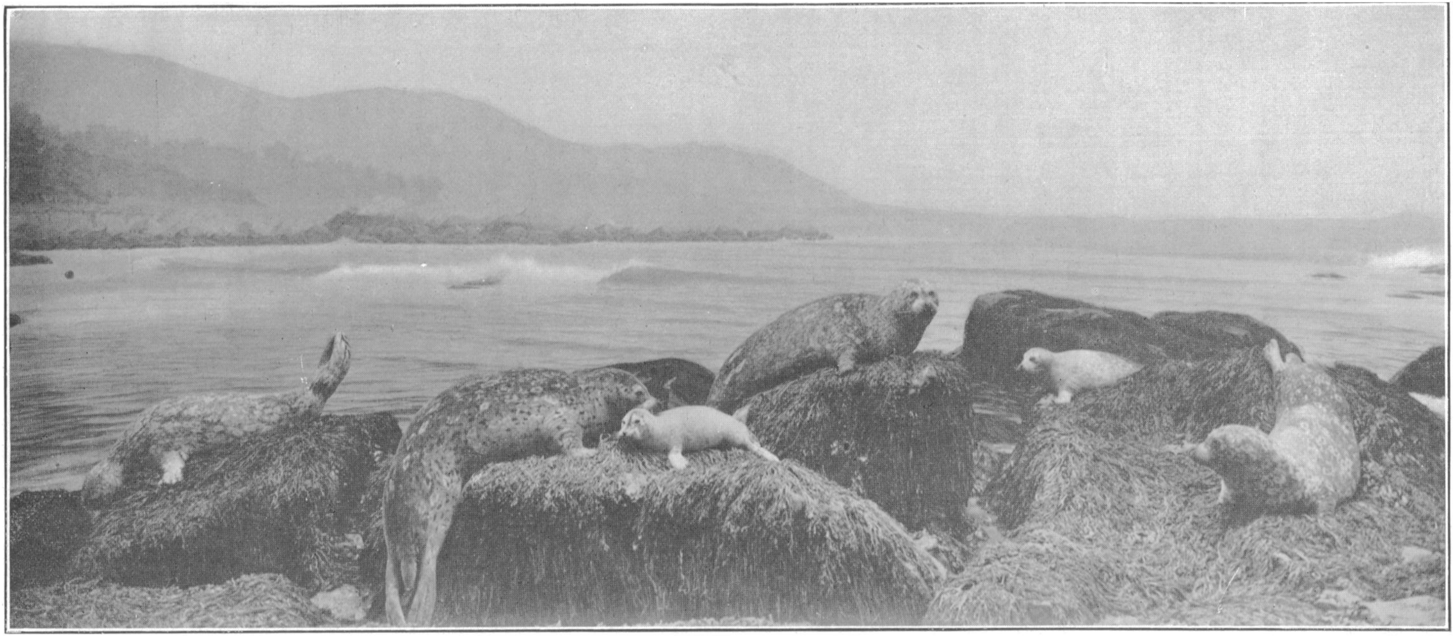

FIG. 8. LEOPARD SEAL (*Phoca richardi geronimensis*)

These interesting seals are fairly common in many places along the California coast, particularly in the bays. Unlike the fur seals which are highly polygamous, the harbor seals are monogamous. On the California coast the young are born in April and May; one pup is the rule. These seals are not migratory, nor are they as gregarious as other seals. They are comparatively silent, not making a loud roaring or barking as sea lions do. They are fond of basking in the sun, especially at low tide. On the land they are clumsy creatures. They move by pulling themselves forward by their foreflippers; in swimming the hind flippers do most of the work. The rookery here shown is at Cypress Point near Pacific Grove, California, where the animals were obtained. The background was painted by Charles Bradford Hudson.

part of the hall. The light *outside* the case is stronger than that *in* it, with the result that everything about the case is reflected in it, always confusing and sometimes quite obscuring the object one wishes to see. This difficulty, we think, has been almost entirely overcome and reflection into the cases practically eliminated by the system of lighting adopted by this museum. This system, as already mentioned, is by means of large skylights over each case and much smaller skylights over the middle of the hall where the observer stands, so small that they let in so little light that there is practically no reflection. Provision is made for artificial lighting at night and on dark days by means of electric lights with reflectors installed outside the cases and above the ceiling glass. There are also shades placed immediately under the skylights, by means of which the light can be modified as required.

The academy has been fortunate in being able to secure several of the best artists in America skilled in this kind of work to paint the backgrounds. One or more backgrounds have been painted by Charles Abel Corwin, of Chicago, Charles Bradford Hudson, of Pacific Grove, California, Maurice G. Logan, of Berkeley, and Worth Ryder, of Oakland. Mr. Corwin has probably had more experience in painting habitat group backgrounds than any other artist in this country. He has done a good deal of work of this kind for the Field Museum, and it was he who painted the really wonderful Laysan Island bird cyclorama for Dr. C. C. Nutting in the University of Iowa. Captain Hudson has also had considerable experience in this field. His backgrounds show an interpretation and finish which can hardly be excelled. But the work of all the artists is of the highest order of excellence. It is difficult, if not impossible, to see wherein any of the backgrounds could be improved.

All matters pertaining to the preparation and installation of the groups have been under the immediate direction of Mr. John Rowley, chief of exhibits. Mr. Rowley is a real artist in his line, remarkably resourceful in devising ways and means for accomplishing the best results. To Mr. Rowley must be given in large measure the credit for the wonderfully attractive and highly instructive habitat groups which are now to be found in the museum of the California Academy of Sciences.

In addition to habitat groups permanently installed in the museum, the academy has begun the preparation of small portable groups and exhibits to loan to the schools. These portable groups are in cases of convenient size and substantially made. The exhibit may be that of a species of bird, mammal, reptile or

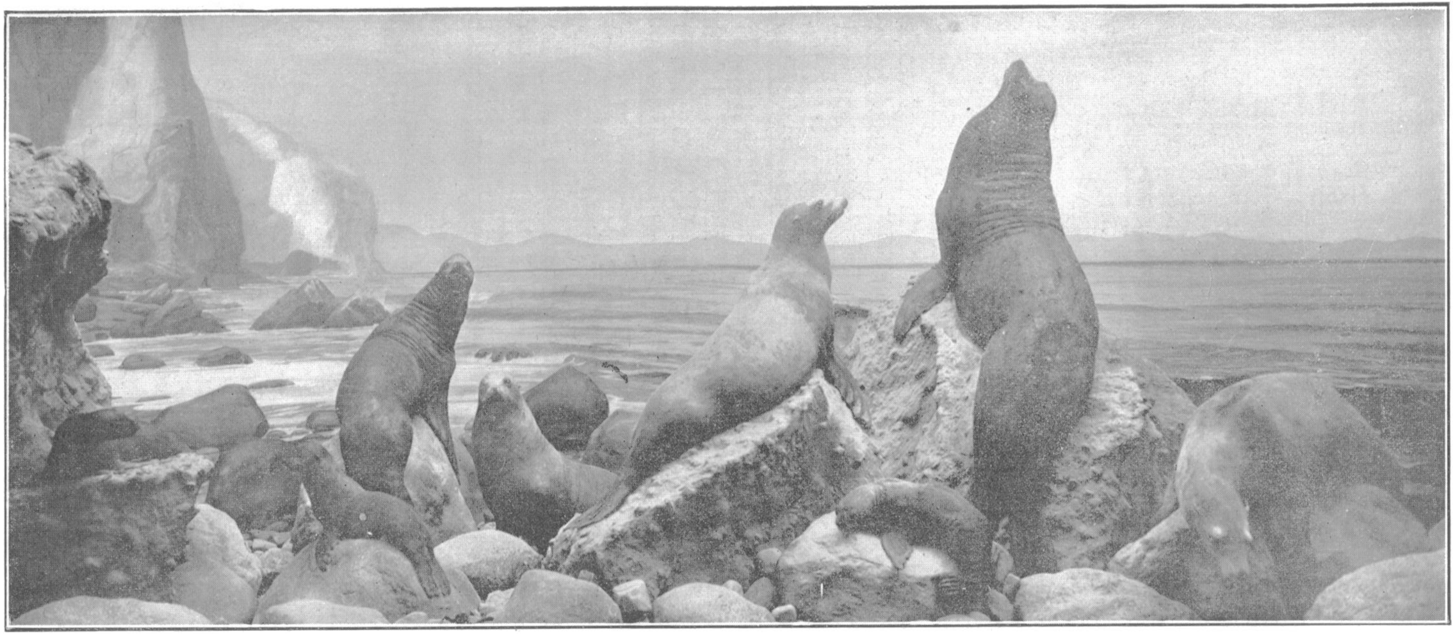

FIG 9. CALIFORNIA SEA LION (*Zalophus californianus*)

This sea lion occurs on the sea coast and islands of California from San Francisco southward, breeding in many places, particularly on the Santa Barbara Islands. The rookery here shown is on Santa Cruz Island. Owing to their intelligence and small size this is the species of sea lion that is commonly trained and shown in zoological gardens and elsewhere. The males are darker in color than the females, and are sometimes called black seal lions. Another characteristic of the male of this species is the great development of the bony crest on the top of the skull. In early days sea lions were killed by thousands on the California coast for their hides and oil, but they have now become so reduced in numbers that sealing is no longer profitable. Sea lions as well as leopard seals are now protected on the California coast both by the state and federal governments. Among sealers the males are called "bulls," the females "cows," and the young "pups." The breeding season is from June to August, only during which time the males are found on the rookeries; at other times they go off in bands or singly living their lonely life. Background painted by Worth Ryder.

fish; it may be a group of butterflies or other insects; or it may be typical specimens of instructive minerals, fossils or plants. These exhibits are selected with the specific purpose of furnishing illustrative material for the nature work provided in the public schools. Each exhibit is accompanied by a simple explanatory label.

The museum also maintains a course of lectures throughout the year adapted to adults, and plans to conduct courses adapted to school children of the different grades, as already explained.

As I have already indicated, the educational function or duty is now the dominant influence in most of our American museums. Without curtailing in any way their activities in research work, they are making a special effort to be of real service in the educational field. The feeling among museum men may be expressed in this way: We have long had public schools and public libraries working to educate and train our people, why not public museums for the same purpose? And there are enthusiasts, men of vision, who believe the modern natural history museum will soon be so perfected in its equipment and methods that it will become the most potent force in giving to our children the education and the training that is most worth while.

We all well know how lamentably the public schools are failing to give the education and training they should give. We know how illy prepared our boys and girls are for the life they must live. We know that much which they get in the schools bears little or no relation to the life they are now living or that which they must live as men and women. We know that many of the subjects taught in the schools possess little or no educational value; that others which have value do not receive proper time allotments in the curriculum. For example, arithmetic in the grades receives 25 or 40 minutes per day for 8 years, while physiology and the care of one's health get but 15 minutes per week for a part of one year! It is even worse in the high schools. There the courses of study are devised in many schools to meet college entrance requirements. When we remember that 40 to 50 per cent. of the pupils who enter high school survive only one year or less, that only 3 or 4 per cent. ever go to college, it is evident that courses framed to meet college entrance requirements are meeting the needs of a *very small percentage* of the high-school pupils. It is not true, as we sometimes hear, that the course of high-school studies which best fits for college entrance requirements is the course which best fits for life. We must put it the other way and say that the studies which best

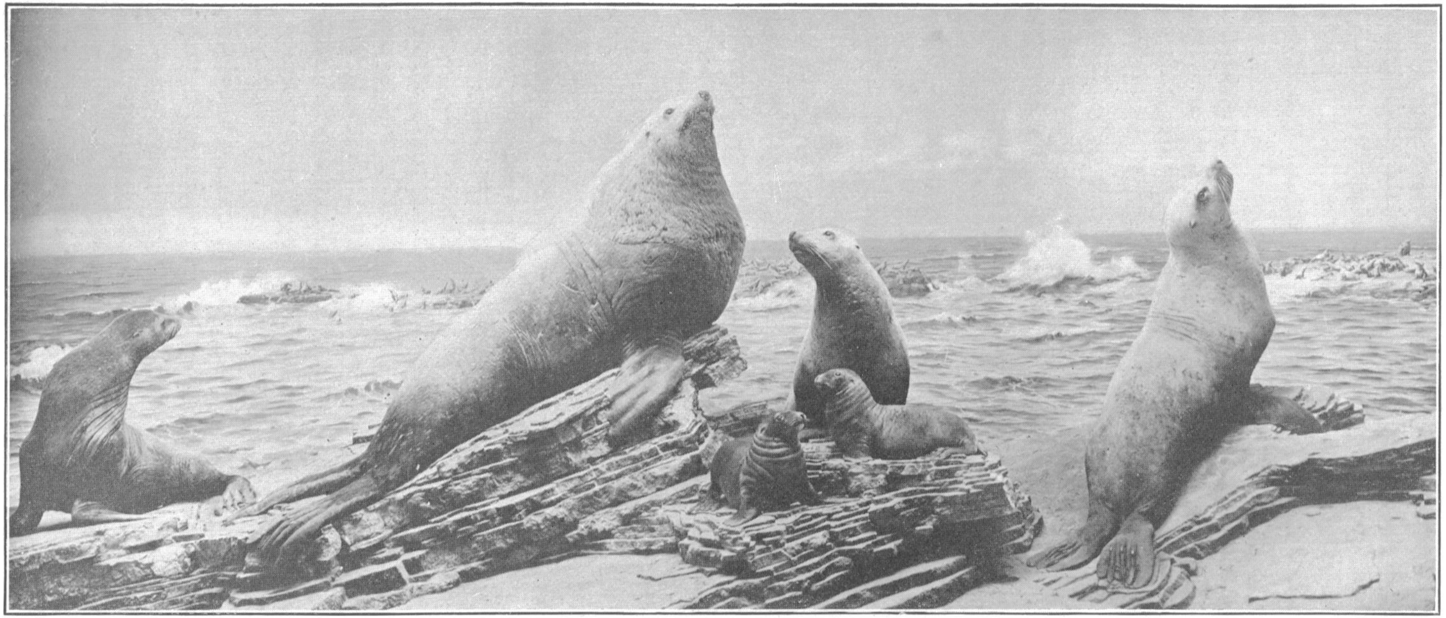

FIG. 10. STELLER'S SEA LION (*Eumetopias stelleri*)

This magnificent animal ranges from the Santa Barbara Islands northward into Bering Sea. Formerly very abundant, persistent killing for its hides and oil has reduced its numbers greatly. Within the last few years they have entirely ceased breeding on the famous seal rocks near the Cliff House at the Golden Gate. A few individuals still resort to these rocks but they no longer breed there. These animals reach a large size. The adult bull shown in the group weighed 1,810 pounds. There is a great difference in size between the sexes, the females being not more than half as large as the males. Fishermen almost without exception claim that the sea lions are very destructive to the commercial fisheries. This is probably true at certain seasons and in some localities, but investigations have not fully sustained the charge. The breeding season of this species on the California coast is the latter half of June. One young is produced at a birth. The noise made by the Steller sea lion is a loud roar, resembling that of a real lion; this, together with the long yellowish hair of the necks of the bulls, doubtless leads to the name sea lion. This group shows the breeding rookeries on Año Neuvo Island just south of San Francisco. **Background painted by Charles Abel Corwin.**

fit the boy or girl for life are the studies which should best fit him for college should he go to college.

Domination of the high school by the college should stop; it should not be longer tolerated. There are too many subjects in the high-school courses, many of them put there specifically to meet absurd college entrance requirements, which bear no relation to what the average high-school student has ever done or ever will do. They possess no life value. They do not touch the life of to-day; they will not touch the life of the future.

Not long ago I visited a small village school. There I saw a class of country boys and girls, not one of whom is ever likely to go to college, or to be more than a laborer or mechanic or farmer in a small way; yet those poor children were being crucified on the Latin cross for 40 minutes every day. To the life they are living and the life they will live, Latin bears no relation; it does not touch their life anywhere. To them Latin is a subject *in vacuo*. In the high schools there are too many subjects of that kind, and much of the teaching I have seen is teaching *in vacuo*. Although the subject may be a proper one, as chemistry, history, geography or biology, it is often taught without relation to what the child already knows or the things with which he is concerned. Such teaching is "teaching *in vacuo*." The high-school pupil can often truthfully say of the subject and the laborious efforts of the teacher: "It never touched me." But poor teaching can be improved and made good, effective teaching; a useless subject, never.

That our schools are failing to give the education and training which fit for life is evident. The failure is, I believe, primarily due to the fact that the subjects taught are almost entirely memory subjects, or are so taught as to be little more than memory subjects. Little attention is paid to the training of the senses, or to acquiring skill of eye, ear or hand, or to acquiring those habits of accurate recording and cautious reasoning which modern science prescribes. The curriculum is made up largely of *faith subjects*—subjects which merely require the pupil to *believe* something that the text-book or the teacher says. No contact with real things; no training of the eye, hand or reasoning powers; no examination of facts or evidence; no reasoning and the forming of independent judgments; simply a memorizing of useless text-book statements. The facts or data upon which the judgment was based were examined by some one else, and the book and the teacher are like the keeper of a ready-made clothing store—they simply hand out to the pupil the ready-made judgment or conclusion and

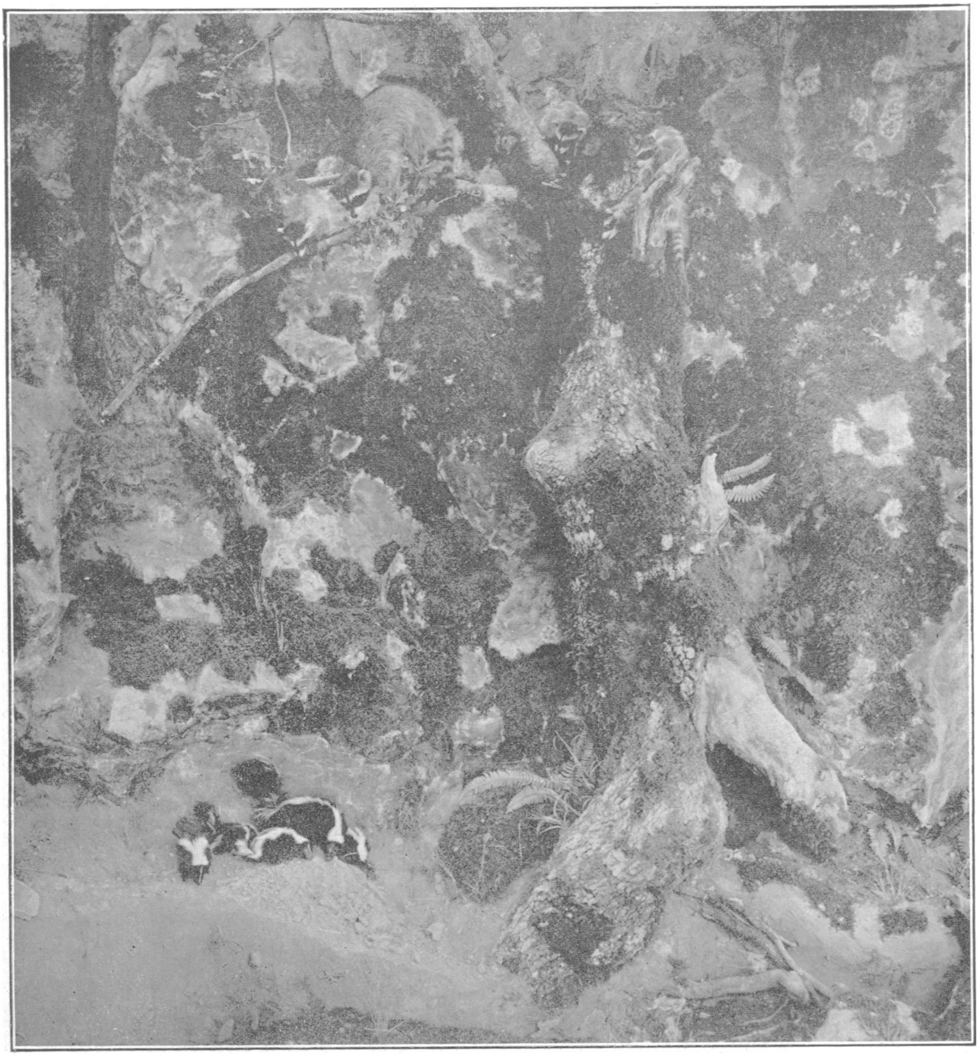

FIG. 11. CALIFORNIA RACCOON AND STRIPED SKUNK

This raccoon is found throughout most parts of California, it being especially abundant in the heavily timbered country along the coast. The coon breeds in hollow trees, in holes in the rocks, in blind ditches, and even on the ground in tule swamps. Coons are omnivorous; they eat shellfish, frogs, fish and corn; they sometimes enter hen houses and kill and devour chickens. In the South the negroes are very fond of the raccoon, regarding its flesh as a delicacy. The raccoon ranks third in value among the fur bearers of Cailfornia. The species of skunk shown in this group occurs throughout northern California except in the warmer interior valleys from Monterey northward. The skunk brings forth its young in holes in the ground, beneath buildings, in stone piles or in hollow logs. They feed largely on insects but will eat flesh of any kind, including chickens. As a fur bearer the skunk is among the most valuable in the United States. In some states skunk farming has become a profitable industry.

will not permit him to question it. Our schools are largely dealers in ready-made judgments and opinions; and nearly all second-hand goods at that.

The child is not taught or given an opportunity to examine the evidence for himself and to reach his own conclusion as to what the evidence shows. The book says it is thus and so, and he must not question the book. It is his duty only to read and believe. He must take on faith what the book and the teacher say. He is even disciplined if he asks any questions or manifests any doubt.

And what is the result? Almost invariably this: Any spirit of the investigator he may have had when he entered school is crushed out of him and he leaves school and goes through life taking things on faith. He becomes a blind follower. He accepts as true anything which he reads or is told by any one in whom he has faith. He never asks to see the evidence; he never reasons; he never forms his own judgments. He can not distinguish fact from fancy, reality from fraud. He falls a ready prey to any fallacy or fraud that comes along, however bald it may be; and the more absurd and bald it is the better he seems to like it.

Of course, I do not mean to say that *all* who go through the public schools are such "easy marks" for the army of frauds and shysters—political, religious, economic, health, and a host of others that infest our land, but it is only necessary to call attention to the thousands who are believers in Ralston Health Clubs, double standards, faith cures, and a score of other frauds and fallacies which flourish in this land, to show that they constitute a very large part of our population. America is said to be the home of shysters and quacks; and the public schools are largely responsible. The remedy lies in radical changes in the courses of study and the method of instruction.

It has been shown that the secondary schools give not more than one tenth to one sixth of their time to observational, sense-training subjects. It is almost equally bad in the primary schools. I wish to quote President Eliot in this connection. He says:

> The changes which ought to be made immediately in the programs of American secondary schools, in order to correct the glaring deficiencies of the present programs, are chiefly: the introduction of more hand, ear and eye work—such as drawing, carpentry, turning, music, sewing, cooking, and the giving of much more time to the sciences of observation—chemistry, physics, biology and geography—not political, but geological and ethnographical geography. These sciences should be taught in the most concrete manner possible—that is, in laboratories with ample experimenting

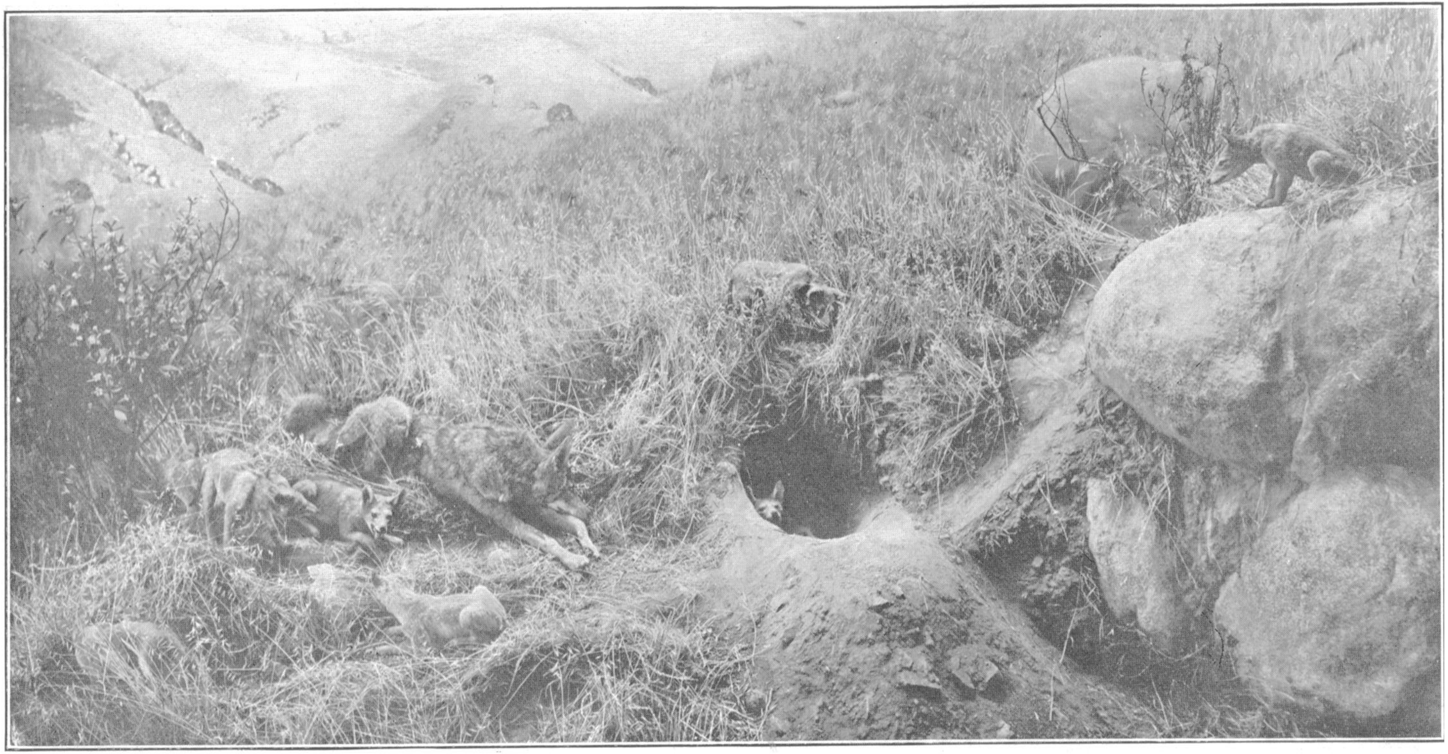

FIG. 12. CALIFORNIA COYOTE

There are several species of coyotes. The one here shown (*Canis ochropus*) is quite common in the San Francisco bay region. The coyote, wherever found, is a cunning, sneaking rascal, very destructive to ground-nesting birds, rabbits, sheep, pigs and poultry, usually nocturnal and predatory in its habits; nevertheless, an interesting animal which easily gains our admiration because of its sagacity. In most states a bounty is offered for its capture. Background by Maurice G. Logan.

done by the individual pupil with his own eyes and hands, and in the field through the pupil's own observation guided by expert leaders.

And here is where the modern natural history museum finds its place as a factor in public education. The modern museum is in fact many laboratories in one. It is as nearly the fields, hills and all out doors as it is possible to make it within doors. The real objects are there in their natural environment and proper relations. They furnish the materials for observation, comparison, study and the forming of judgments. And they make it easy for the teachers to improve their methods of teaching, to teach concretely.

Indeed, they contain the necessary materials for practically all the teaching that need be done in the elementary and secondary schools. They contain and can supply materials not only for all the observational studies, but most of the other subjects, as arithmetic, language, geography, reading, writing, spelling and even morals. All these subjects become concrete, live subjects when related to real things.

Number work and all the fundamental processes of arithmetic, as addition, subtraction, multiplication, and division, become concrete and easily taught and understood when taught with real objects as illustrative material. The same is equally true of geography, many of the principles and important facts of which can be taught as a part of the study of the museum specimens. And no better drill in language and composition is possible than can be had in connection with the study of real things. In asking and answering questions about them and talking about them, excellent drill in spoken language is had; in writing questions and answers and in preparing descriptions and formal compositions about them, the very best of exercise and drill in language, composition, writing and spelling, is afforded. And drill in oral reading and clearness of expression comes with the reading by the pupils of the compositions and statements they have written.

When a pupil writes a composition on some material object that is put into his hands, some object that he has seen and handled and studied, he writes what he himself knows, he gives expression to that which he himself has experienced. It is knowledge, not mere information. He is dealing with realities, with truth, not with imagination.

And such exercises and studies as these are the very best possible to develop character. To realize the stability of truth, to realize that unchanging, immutable law pervades the universe, that everything is subject to law, that ignoring or violat-

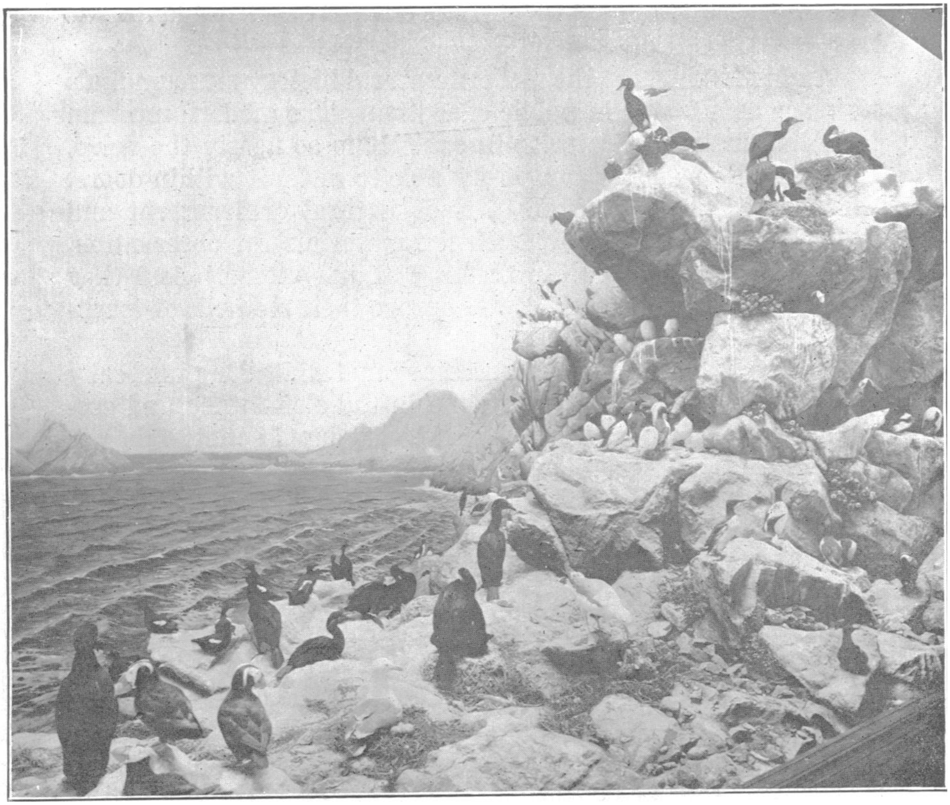

FIG. 13. FARALLON ISLANDS BIRD ROOKERY

In this group, presented to the California Academy of Sciences by the Hon. Wm. H. Crocker, are shown the ten species of sea birds and the one land bird (the little rock wren) that breed on the Farallon Islands. These rocky islands are about 30 miles off the Golden Gate, from which they may be seen on any clear day. Thousands of sea birds resort to these cliffs to lay their eggs and rear their young, one of the most common species being the western gull which, during the rest of the year, is very abundant about San Francisco, following the ferry boats across the bay. Until a few years ago thousands of Murre's eggs were brought each year from these rookeries and sold in San Francisco to the bakeries and pastry shops. The islands are now a federal reservation and the birds and their eggs are rigidly protected. Background painted by Maurice G. Logan.

ing law leads to disaster—all this develops stability of character. They are conditions of mind which cause respect for law and truth and order and honesty, and they develop those traits of character.

And now in conclusion permit me to say a word regarding one more of the interesting and important recent developments in museum activity, namely, the Children's Museum or the Children's Room. This is clearly one of the results of the growing conviction that the museum is a public educational institution which should meet the needs of all ages and classes of people. While many of the public museums of America have realized this need and have been trying more or less successfully to meet it, the institution which has been most successful in this very important field is undoubtedly the Children's Museum of the Brooklyn Institute of Arts and Sciences.

Under the able direction of Miss Anna Gallup really wonderful results have been attained. Children are naturally interested in animals and plants, the material things about them, and the forces and phenomena of nature. As President Eliot has so well said:[2]

> The best part of all human knowledge has come by exact and studied observation made through the senses of sight, hearing, taste, smell and touch. The most important part of education has always been the training of the senses through which that best part of knowledge comes. This training has two precious results in the individual besides the faculty of accurate observation—one, the acquisition of some sort of skill, the other the habit of careful reflection and measured reasoning which results in precise statement and record.
>
> A baby spends all its waking time in learning to use its senses, and to reason correctly from the evidence of its senses. At first it reaches after objects near by and far off alike, but gradually learns to judge by the eye whether or not it can reach the object seen. It tries to put everything into its mouth, perhaps in an effort to estimate size and shape correctly—which at first it can not accomplish by the eye alone, as the adult does. . . . The baby's assiduity in observation and experimentation, and the rapidity of its progress in sense-training are probably never matched in after-life. Its mind also is trained fast; because it is constantly practising the mental interpretation of the phenomena which its senses present to it.

The child undoubtedly acquires more real knowledge during the first five or six years of its life, before it ever enters the formal schools, than it does in all the after years.

The boy on the farm has admirable opportunities to train eye and ear and hand; because he can always be looking at the sky and the soils; the woods, the crops, and the forests; the streams and the hills; he daily, even hourly, sees the wild animals, the birds, the mammals, the insects, that usually abound about him; the domestic animals on the farm he learns to know most intimately; he learns to use various tools, he hears the innumerable sweet sounds which wind, water, birds and insects make on the countryside, and when he is hunting, fishing or merely roaming in the woods and fields and along the streams.

All this is education of the right sort—which is rarely or never equalled in the schools—because it is all most intimate personal experience, the only way in which actual knowledge can be acquired.

That this natural method—the only method by which knowl-

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[2] Changes Needed in American Secondary Education."

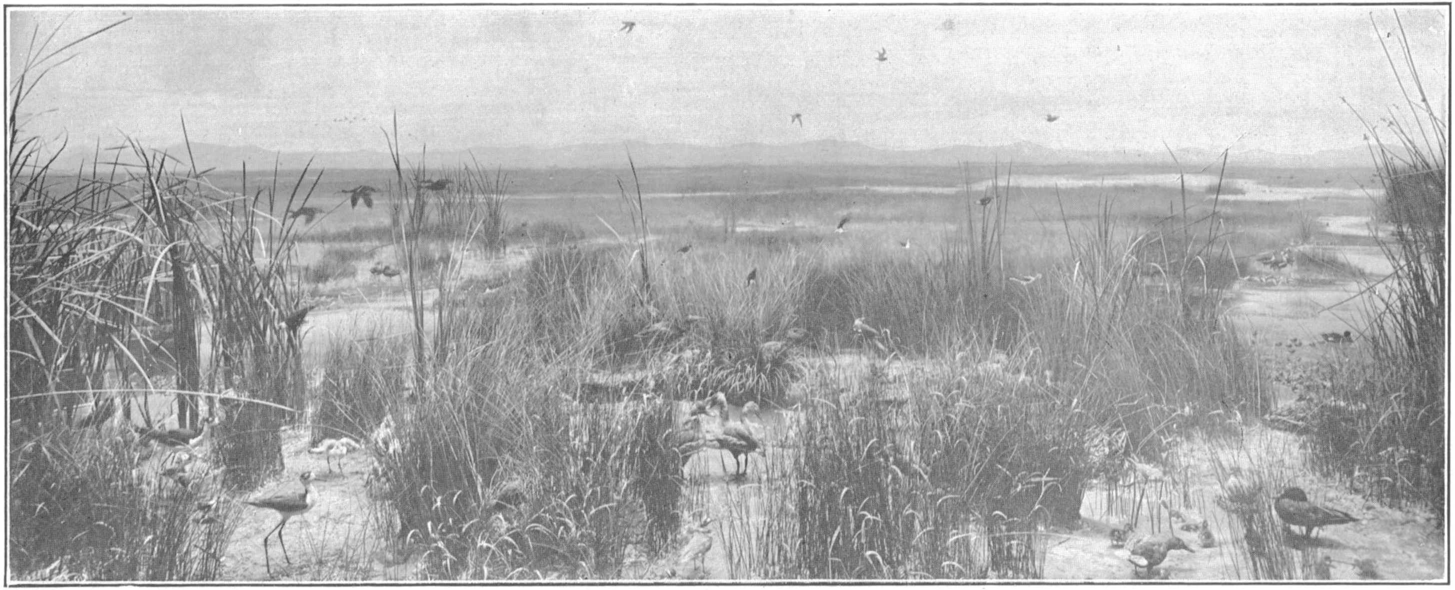

FIG. 14. SAN JOAQUIN VALLEY BIRD GROUP

Presented to the Museum of the California Academy of Sciences by Hon. Joseph D. Grant. In the spring and early summer it is the practise of the cattlemen of the San Joaquin Valley to flood their land with water, to a depth of 6 to 18 inches, to induce a ranker growth of grass for pasture. Many thousand acres are thus flooded and converted into marsh land, to which vast numbers of ducks, waders and other swamp-loving birds are attracted. During the breeding season great numbers of birds resort there to build their nests, lay their eggs, and rear their young. These breeding grounds are frequented by more than 30 species of birds. Among those shown in this group, which shows a typical breeding ground near Los Baños, Merced County, California, are the fulvous tree duck, cinnamon teal, shoveler, red-headed duck, coot, American bittern, least bittern, glossy ibis, avocet, black-necked stilt, killdeer, red-winged blackbird, yellow-headed blackbird, tule wren, little black tern, Forster's tern, and the Virginia rail. In order to show in a limited area a considerable number of species it was necessary to bunch the birds a little more closely than they actually occur in nature. The background was painted by Maurice G. Logan.

edge can be acquired—should be so largely, almost wholly, abandoned when the child enters the schools, is hard to understand, but it is lamentably true. The schools, instead of continuing the methods and processes by which knowledge is gained, almost without exception subject the child to processes and methods which result merely in the acquiring of information, most of which is of little or no value in the development of character or in fitting the child to live the life he must live.

The Children's Museum is different from the conventional public school. Its method is that with which the children are very familiar before they ever enter a public school—the method by which knowledge is acquired. The Children's Museum continues this method. The children, even into and through their teens, continue to deal with realities; they continue to use their eyes and ears and organs of taste and smell and touch, for the museum is simply certain parts of nature, of outdoors, brought indoors for examination and study; all selected with reference to their educational value. The imparting of information, or mere book information, has no place, or, at most, a very subordinate place, in a museum.

Unfortunately, the schools, which might have continued this natural method, have for the most part clung to the traditional programs which rely chiefly on studies which train the memory, but which "do not train or drill children in seeing and hearing correctly, in touching deftly and rapidly, and in drawing the right inferences from the testimony of their senses."

A well-appointed children's museum or children's room will have in it those natural objects which have always interested children everywhere. There will be brightly and curiously colored birds and butterflies, moths and beetles, and other insects, curious animals of other groups, attractive minerals, growing plants, and aquariums with interesting animal and plant life; colored transparencies of beautiful flowers, all selected and arranged with reference to the telling of an interesting story, the teaching of a definite lesson.

And there will be in this children's museum simple tools and machinery for training the hand and eye, laboratories where the little girls can learn to do by doing and where they can, through practise, become familiar with many of the simple principles of domestic science and art; and others where the boys can become familiar with the simple tools and machines and become proficient in their use. There is no limit beyond which this training of the hand and eye may not be carried. As an illustration, in the Children's Museum in Brooklyn, a

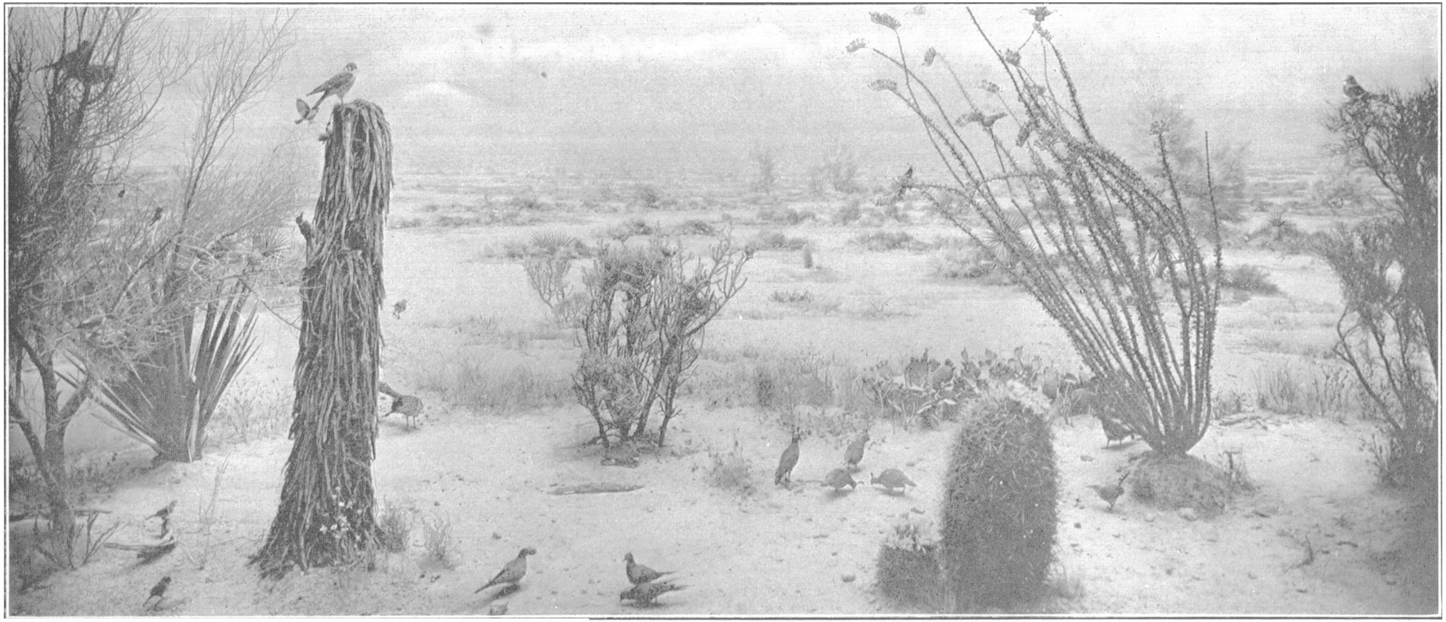

FIG. 15. DESERT BIRD GROUP

In this group, presented to the California Academy of Sciences by Hon. Wm. B. Bourn, are shown, under natural surroundings, several species of the birds that nest in the Colorado and Mohave deserts of southern California. The particular locality represented is in Riverside County, California. The spring rains transform the desert into a veritable flower garden, the many and varied forms of vegetation sending forth an astonishing amount of beautiful bloom. Then is the nesting time of the birds, which are there in surprising numbers, some of them, as the hooded oriole and the vermilion flycatcher, rivaling the flowers in brilliancy of coloration. The total number of species of birds nesting in this part of the Colorado desert is more than a score, and some species, as Gambel's quail, are very abundant. The nests, however, are usually widely scattered except in the vicinity of water. Background painted by Charles Bradford Hudson.

special feature has been made of wireless telegraphy, and a number of boys who got their training in that museum are now occupying responsible positions in charge of wireless plants or as skilled operators in various parts of the world.

It is of vital importance that the right sort of person be placed in immediate charge of the children's museum or children's room; a well-educated, kindly, sympathetic woman or man who knows the specimens in the museum and the live things in the park or fields or woods about it; and who, above all, knows and loves children; one who can wisely direct the observation and the reading of the children so that they may correlate their reading with what they have seen in the museum or the open, and thus increase rather than stifle their love for animate things, as our public schools almost invariably do. In such a museum it will be arranged so that the children of the different grades will come to the room at different hours and receive in turn the instruction and help adapted to their respective needs.

There is no better thing which any city, town or village can do than to establish and maintain a museum of this kind. In some form or another it is already being done by the Children's Museum of Brooklyn, also by the American Museum of Natural History in New York, the Charleston Museum, the Milwaukee Public Museum, the Chicago Academy of Sciences, and elsewhere. The time is not far distant, I verily believe, when the same will be done in many other cities and towns. It will be done because it so evidently appeals to us all as the *right thing to do,* the right sort of education and training to give to our children. It will be done, because the beauty of it all, for the little children's sake, will appeal to those who have prospered in this world; those with kindly hearts, who love children, and who want them to become the men and women they should become; and the time is now ripe for these good men and women who are able to do so to come forward, and out of their abundance do this splendid work not only for the children of to-day but for those of the years to come.

HABITAT GROUPS IN THE MUSEUM OF THE CALIFORNIA ACADEMY OF SCIENCES

The California Academy of Sciences has recently installed in its new museum in Golden Gate Park a large number of habitat groups of important species of California mammals and birds, one large hall being devoted to mammals, and another to birds.

The central, controlling thought with these groups has been to make them as true to life as possible and of the highest educational value. To accomplish this object the taxidermist who was directly responsible for the group went to the locality where the animals were secured and studied the local environment, collecting specimens of the shrubs, grasses, flowers, rocks, etc., found there. With these, properly preserved, and with artificial flowers, etc., when necessary, he was able to reproduce the actual environment with great fidelity.

In each group is a curved painted background connecting so perfectly with the actual objects in front that it is difficult, if not impossible, to tell where the real ends and the painted begins.

In every case the artist visited the region where the animals were taken, studied the scenery, made his field sketches and studies, and when he made his final painting he was able to give what is in effect a painting of a real scene somewhere in the region where the species is naturally found.

THE SCIENTIFIC MONTHLY is able to reproduce photographic illustrations of a number of these groups. The groups were installed under the general supervision of Dr. Barton Warren Evermann, the director of the museum, the mammal groups under the immediate direction of Mr. John Rowley, assisted by Mr. Joseph P. Herring and Mrs. M. L. Pariser. The bird groups were prepared under the immediate direction of Mr. Paul J. Fair, assisted by Mrs. M. L. Pariser.

The backgrounds were painted by Charles Abel Corwin, of Chicago, Charles Bradford Hudson, of Pacific Grove, California, Maurice G. Logan, of San Francisco, and Worth Ryder, of Oakland, all well-known artists. Each of these artists has been marvelously successful in depicting the natural environment of the animals with which he had to deal.